

COMPARING LIGHT BULB TEMPERATURES

*Taken from the Green Schools Tool Kit Manual to be used in conjunction with the tool kit

Objective: Students will measure the temperatures of various light bulbs to find out how their heat output relates to energy efficiency.

Time: 1 class period

Suggested Grade Level: Can be modified for grades 2 – 9

Equipment:

- Infrared thermometer*
- Watt meter*
- 3 incandescent light bulbs in a variety of wattages (at least one in the 60-100 watt range)
- 1 compact fluorescent light bulb (15-20 watts)*
- A desktop light fixture with a standard light bulb socket
- Safety gloves

* From Green Schools Tool Kit

Safety Warning: Use safety gloves when changing the light bulbs as they will be hot and can burn.

ADVANCE PREPARATION

You may plan to do the Comparing Light Bulb Outputs activity at the same time as this investigation.

LEADING THE INVESTIGATION

1. Explain to students how incandescent light bulbs work: The tungsten filament is heated to red hot so that it glows. Point out that only 10 percent of the energy used to run an incandescent light actually goes to lighting the bulb and that the other 90 percent is wasted as heat. Tell students that the investigation will help them determine any relationship between the wattage of light bulbs and how much heat they lose.
2. Follow the procedure described on the student page, conducting this investigation as a class demonstration or as a lab station set up for students.

FOLLOW UP

- Students can survey the fixtures around the school to make a preliminary evaluation of their efficiency. They may compare fluorescent lights, exit lights, gymnasium lights, auditorium and stage lighting, and recessed lighting fixtures. They may need to use binoculars to read the labels and wattages on light bulbs in ceiling fixtures.

Comparing Light Bulb Temperatures

Question

Is there a relationship between heat output and wattage in light bulbs?

Your prediction:

Equipment

- Infrared thermometer
- Watt meter
- 3 incandescent light bulbs in a variety of wattages
- 1 compact fluorescent light bulb
- Desk lamp with standard light bulb socket
- Safety gloves

Safety Warning

Use safety gloves when changing the light bulbs as they will be hot and can burn.

Procedure

1. Plug the watt meter into the wall outlet and then plug the lamp into the watt meter.
2. Insert the lowest wattage incandescent light bulb into the lamp. Turn on the lamp.
3. With the watt meter in the wattage mode, record the wattage being consumed by the light. Use the infrared thermometer to measure the temperature of the bulb shell. Every minute after that for five minutes, monitor and record the actual watts and bulb temperature.
4. After turning off the lamp, carefully remove the incandescent bulb using the safety gloves.
5. Repeat the process with each of the light bulbs, ending with the compact fluorescent light bulb (CFL).

Data

	Bulb #1 Wattage rating:		Bulb #2 Wattage rating:		Bulb #3 Wattage rating:		Bulb #4 (CFL) Wattage rating:	
	Actual watts	Bulb temp.	Actual watts	Bulb temp.	Actual watts	Bulb temp.	Actual watts	Bulb temp.
0 min.								
1 min.								
2 min.								
3 min.								
4 min.								
5 min.								

Analyzing the Results

1. How does bulb wattage or bulb style relate to the amount of heat generated?

2. Did the actual wattage consumed match the rating of the light bulb? (Possible reasons for not matching include variations in the size of the filament during production runs, poor quality control by the manufacturer, or differences between the rated voltage and the actual voltage.)

3. Which bulb is the most energy efficient (loses the least amount of heat)?

What else did you learn from the investigation?